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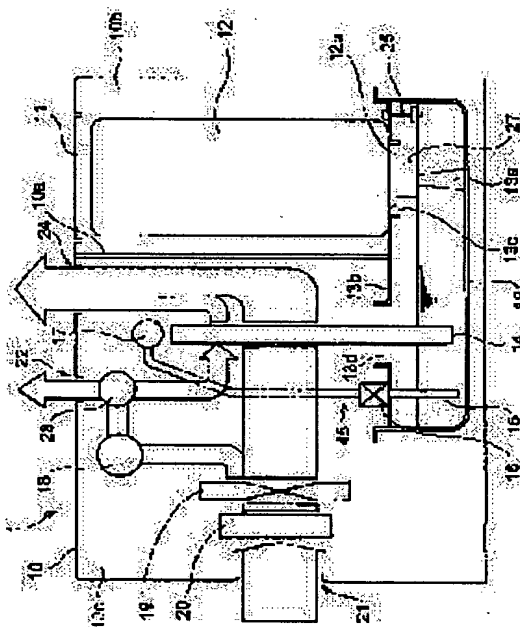
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(54) HUMIDIFIER

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent bacteria, mold, algae, etc., from propagating in a water holding means, in a humidifier of such a system as to bring air into contact with the water holding means in a wet state so as to shift moisture to air.

SOLUTION: This humidifier sends air by blast means 19 to the water holding means 14 kept wet by water supply means 50 so as to shift moisture to the air. The air with its humidity raised is blown out into a room from a blowout port 24. This dries the water holding means 14 to weaken the vigor of activity of bacteria, mold, algae, etc., by stopping the water supply means 50 and driving only the blast means 19. This raises the humidifying capacity or accelerates the drying by heating the air contacting with the water holding means 14 by means of a heating means 20. Moreover, this humidifier is provided with an ion generator 18, and this performs sterilization by blowing the ion cluster consisting of plus ions and minus ions against the water holding means 14. This sends out the ion cluster into a room, too, so as to sterilize the floating bacteria in the air.



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CLAIMS

[Claim(s)]

[Claim 1] The humidification equipment carry out having made possible humidification operation which drives a water-supply means and a ventilation means to coincidence, and water-retention means desiccation operation which stop a water-supply means and drive only in a ventilation means in humidification equipment equipped with a water-retention means, a water-supply means put this water-retention means on a damp or wet condition, and a ventilation means contact air for the water-retention means of a damp or wet condition, transfer moisture to air, and send out this air indoors as the description.

[Claim 2] Humidification equipment according to claim 1 characterized by performing water retention means desiccation operation of predetermined time at first, and shifting to humidification operation after that at the time of the start up of humidification equipment.

[Claim 3] Humidification equipment according to claim 1 or 2 characterized by performing water retention means desiccation operation of predetermined time, and stopping after that at the time of operation termination of humidification equipment.

[Claim 4] Humidification equipment according to claim 1 to 3 characterized by enabling it to heat the air in contact with a water retention means with a heating means at the time of humidification operation.

[Claim 5] Humidification equipment according to claim 1 to 3 characterized by enabling it to heat the air in contact with a water retention means with a heating means at the time of water retention means desiccation operation.

[Claim 6] It is humidification equipment according to claim 5 carried out [predetermined time having used the ventilation means and the heating means together, and having performed water retention means desiccation operation, and having made it predetermined time have stopped the heating means after that, and stop, after only the ventilation means performed water retention means desiccation operation, and] as the description at the time of operation termination of humidification equipment.

[Claim 7] Humidification equipment according to claim 1 to 6 characterized by what air was heated for by the elevated temperature rather than the time of humidification operation at the time of water retention means desiccation operation while enabling it to heat the air in contact with a water retention means with a

heating means at the time of humidification operation or water retention means desiccation operation.

[Claim 8] Humidification equipment according to claim 1 to 7 characterized by putting side by side the apparatus for generating ion which sends out ion during indoor air.

[Claim 9] Humidification equipment according to claim 8 characterized by spraying the ion which said apparatus for generating ion generated on a water retention means at the time of humidification operation or water retention means desiccation operation.

[Claim 10] Humidification equipment according to claim 8 or 9 characterized by sending into an apparatus for generating ion a part of airstream generated by the ventilation means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the humidification equipment which is independent, or can be combined and can be used for air-conditioning equipment. In addition, "air-conditioning equipment" can mean the device at large which the physical properties of air are changed and makes a desired ambient atmosphere, and an air conditioner, an air cleaner, a fan heater, etc. can be hung up as the example.

[0002]

[Description of the Prior Art] There are temperature, humidity, a pollutant, etc. in the management element in air-conditioning. About humidification, various methods were proposed from the former also in humidity management. For example, there is a method which is made to boil water and is diffused in air in the form of a steam, or a method which atomizes water by the supersonic wave and is mixed in air. Or the water retention means of a large area is prepared, this is put on a damp or wet condition, and there is also a method which air is contacted for this water retention means, and transfers moisture to air.

[0003] There are a merit and a demerit in the above-mentioned humidification method, respectively. For example, although an ebullition method and an ultrasonic sensing method can miniaturize equipment, the former is an energy multi-consumption mold and equipment cost of the latter is high. In that equipment is miniaturized, although it is disadvantageous, the method using the water retention

means of a large area does not need energy so much, but its equipment cost is cheap and it has the merit that operational reliability is also high.

[0004] The example of the humidification equipment of a water retention means method can be seen in JP,58-148520,U, a 62-2936 official report, and a 63-134326 official report.

[0005] Each humidification equipment indicated by the three above-mentioned official report dips the lower limit of a water retention means in water thru/or deodorization liquid, and is presupposing it that a water retention means is always put on a damp or wet condition. If it is in such equipment, bacteria, mold, algae, etc. breed in a water retention means, and it becomes the basis of an offensive odor, and also it poses a problem that these selves or the spore of those is indoors sprinkled by the wind. The sprinkled matter may cause an infectious disease depending on the class.

[0006] The water retention means is made to contain a deodorant in equipment given [said] in JP,63-134326,U. Although an offensive odor can be controlled by this, if the engine performance of a deodorant falls, a water retention means must be exchanged. Moreover, the propagation itself, such as bacteria, mold, and algae, cannot be controlled.

[0007] Since equipment given [said] in JP,62-2936,U is used as the deodorization liquid which blends a soil bacillus and a vegetable enzyme into the activated carbon for odor uptake, a surfactant, and the mixture of purified water, and has deodorization and the sterilization effectiveness, it can expect propagation depressor effect, such as bacteria, mold, and algae. However, the deodorization liquid of such a special presentation is always prepared, and there is a fault that it must supply whenever volume decreases.

[0008]

[Problem(s) to be Solved by the Invention] This invention aims at enabling it to control that bacteria, mold, algae, etc. breed in a water retention means with an easy equipment configuration in the humidification equipment of the method which air is contacted for the water retention means of a damp or wet condition, and transfers moisture to air. It combines, and while acquiring disinfection and the bactericidal effect of the bacteria which increase the amount of ion in air and float in the relaxation effectiveness or air, it aims at offering the humidification equipment which was made to perform disinfection and sterilization of a water retention means with ion.

[0009]

[Means for Solving the Problem]

[0010] Water-retention means desiccation operation stop humidification operation which drives a water-supply means and a ventilation means to coincidence in this invention in humidification equipment equipped with a water-retention means, a water-supply means put this water-retention means on a damp or wet condition, and a ventilation means contact air for the water-retention means of a damp or wet condition, transfer moisture to air, and send out this air indoors, and a water-supply means in order to attain the above-mentioned purpose, and drive only in a ventilation means made possible.

[0011] Thus, by stopping a water supply means, driving only a ventilation means, and drying a water retention means, bacteria, mold, algae, etc. breed in a water retention means, and it can control generating an offensive odor or becoming the cause of an infectious disease.

[0012] Moreover, in this invention, at the time of the start up of humidification equipment, we performed water retention means desiccation operation of predetermined time at first, and decided to shift to humidification operation after that. Thereby, though bacteria, mold, algae, etc. were breeding during the shutdown period, where the activity is weakened, it can humidify. Stinking thing generating in early stages of operation is also prevented.

[0013] Moreover, in this invention, at the time of operation termination of humidification equipment, we performed water retention means desiccation operation of predetermined time, and decided to carry out the drop dead halt of the humidification equipment after that. Thereby, it can prevent bacteria, mold, algae, etc. breeding during a shutdown period.

[0014] Moreover, it enabled it to heat the air in contact with a water retention means with a heating means in this invention at the time of humidification operation. Thereby more many moisture is evaporated and humidification can be sped up.

[0015] Moreover, it enabled it to heat the air in contact with a water retention means with a heating means in this invention at the time of water retention means desiccation operation. Thereby more many moisture is evaporated and desiccation of a water retention means can be promoted.

[0016] Moreover, predetermined time used the ventilation means and the heating means together, and water retention means desiccation operation was performed, and after predetermined time performed water retention means desiccation operation only with the ventilation means, it was made have stopped the heating means, and to stop after that, in this invention, at the time of operation termination

of humidification equipment. By this, after fully cooling a heating means, the drop dead halt of the humidification equipment can be carried out, and safety can be raised.

[0017] Moreover, in this invention, while enabling it to heat the air in contact with a water retention means with a heating means at the time of humidification operation or water retention means desiccation operation, at the time of water retention means desiccation operation, air was heated by the elevated temperature rather than the time of humidification operation. Thereby, a water retention means can fully be dried and sterilization also progresses.

[0018] Moreover, in this invention, the apparatus for generating ion which sends out ion during indoor air was put side by side to humidification equipment. Disinfection and the bactericidal effect of the bacteria which increase the amount of ion in air and float in the relaxation effectiveness or air by this can be acquired.

[0019] Moreover, in this invention, we decided to spray the ion which the apparatus for generating ion generated on a water retention means at the time of humidification operation or water retention means desiccation operation. Thereby, a water retention means can be disinfected and sterilized with ion.

[0020] Moreover, in this invention, we decided to send into an apparatus for generating ion a part of airstream generated by the ventilation means. Thereby, it is not necessary to prepare the fan only for apparatus for generating ion.

[0021]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention humidification equipment is explained based on drawing.

[0022] Drawing 1 shows the outline configuration of humidification equipment 1. 10 is housing and the interior is divided by water tank compartment 10b and ventilation compartment 10c by perpendicular septum 10a. The lid 11 which can be opened and closed freely is formed in the top face of water tank compartment 10b, and a water tank 12 is inserted from here. 13 is the water receptacle pan arranged so that the pars basilaris ossis occipitalis of water tank compartment 10b and the pars basilaris ossis occipitalis of ventilation compartment 10c may be straddled, and a water tank 12 is attached in wood deck 13b of the top face.

[0023] It is only equipping one side face with filling port 12a as opening, and a water tank 12 supplies water in a tank from here. After supplying water, filling port 12a is sealed with the screw-type cap 27, and a water tank 12 is made to do a handstand, and it places on wood deck 13b so that filling port 12a may turn to the bottom. Cap 27 projects into the water receptacle pan 13 from opening 13c prepared in wood

deck 13b.

[0024] the structure of filling port 12a and cap 27 — drawing 2 R — it is as 2 and 3 seeing. It is made by the core of cap 27 so that water supply opening member 27a of a cartridge may project on the outside of a water tank 12. There is bearing 27b of the cartridge supported by four spoke 27c at the core of water supply opening member 27a, and between water supply opening member 27a and bearing 27b serves as 27d of water supply openings. A shaft 28 is supported by the core of bearing 27b free [the direction slide of an axis]. Moreover, flange 28a is made by the end of a shaft 28, and the shaft 28 is always energized towards the outside of a water tank 12 by the compression spring 29 inserted between this flange 28a and bearing 27b. 30 is the valve disk made of rubber attached in the other end of a shaft 28, is stuck to water supply opening member 27a according to the energization force of a compression spring 29, and shuts 27d of water supply openings. In addition, in order to improve adhesion to water supply opening member 27a, the valve disk 30 serves as a configuration which is Mukai and curved in the shape of a convex lens to water supply opening member 27a. These shafts 28, flange 28a, a compression spring 29, and the valve disk 30 constitute the valve unit 31.

[0025] Valve disconnection pin 13a starts from the base of the water receptacle pan 13. If a water tank 12 is put on a predetermined location, valve disconnection pin 13a will produce a clearance 43 for this in a shaft 28 between push, the valve disk 30, and water supply opening member 27a. 27d of water supply openings is passed from this clearance 43, and water flows into the water receptacle pan 13. When water level arrives at the lower limit of water supply opening 27a, water stops flowing out of a water tank 12 more than it with atmospheric pressure. Since water will flow out of a water tank 12 so that it may be compensated if water is consumed, the water level in the water receptacle pan 13 is always kept constant. At least the water with which 25 detects the water level in the water receptacle pan 13 is a sensor.

[0026] In ventilation compartment 10c, the flat water retention means 14 of a rectangular parallelepiped configuration is arranged in the form which made perpendicular the principal plane (field where area is the largest) of the rectangular parallelepiped configuration. The water retention means 14 constituted the grid from a nonwoven fabric, air passed along the inside of the hole of the grid, and the grid configuration has appeared in said principal plane. The water retention means 14 is placed on wood deck 13b of the water receptacle pan 13, and is making the lower limit face 13d of openings prepared in wood deck 13b. However, the lower limit of

the water retention means 14 is not under the water in the water receptacle pan 13. [0027] 15 is the water supply pipe which penetrates wood deck 13b, and the lower limit was flooded with the water in the water receptacle pan 13, and has arrived even near the pars basilaris ossis occipitalis of the water receptacle pan 13. The upper limit of the water supply pipe 15 is connected to the water spray pipe 17 arranged horizontally on the water retention means 14. If the conveying pump 16 is formed in the middle of the water supply pipe 15 and this conveying pump 16 is operated, water will be sucked up from the water receptacle pan 13, and even the water spray pipe 17 will be pushed up. Many dropping holes 26 (refer to drawing 4) are formed in the water spray pipe 17, and water pours into the water retention means 14 from here. The location and diameter of the dropping hole 26 are set up so that water may spread round each part of the water retention means 14 equally. Water supply amounts are adjusted according to the amount of humidification.

[0028] The water retention means 14 made of a nonwoven fabric will suck in the water to pour, and will be in a damp or wet condition. Superfluous water is dropped from the lower limit of the water retention means 14, and returns to the water receptacle pan 13. The above-mentioned water supply pipe 15, a conveying pump 16, and the water spray pipe 17 constitute the water supply means 45. The water supply means 45 can be driven only while the sensor 25 is detecting the water level more than predetermined at least for water. When water level falls below to a predetermined value, a display to that effect appears in the display which housing 10 external surface does not illustrate.

[0029] Ventilation compartment 10c has inlet port 21 on a side face, and has an outlet 24 on the top face, and the ventilation flue is formed between them. In this ventilation flue, the heating means 20, the ventilation means 19, and the water retention means 14 are arranged in order [upstream]. The heating means 20 consists of a nichrome wire heater, and the ventilation means 19 consists of a motor made to rotate a propeller fan and this. The ventilation means 19 can change the rotational frequency of a motor, and can adjust blast weight. For energy saving, the heating means 20 is not used, except when the high humidity which makes the standup of humidification quick is called for or it is said that the water retention means 14 is dried.

[0030] 18 is the apparatus for generating ion installed into ventilation compartment 10c. A part of airstream generated by ventilation equipment 19 is sent into an apparatus for generating ion 18 via a bypass path other than a main ventilation flue. And the air which received ion with the apparatus for generating ion 18 is turned to

one side of the following two air courses by the damper 23. The 1 is an air course which comes out indoors from the ion outlet 22 of the top face of ventilation compartment 10c, and the 2 is an air course sprayed on the water retention means 14.

[0031] The structure of an apparatus for generating ion 18 is shown in drawing 5. An apparatus for generating ion 18 uses as the important section of a configuration one pair of electrodes which counter on both sides of a dielectric and this dielectric. With this operation gestalt, it is considering as the dielectric with the glass tube (outer diameter of 20mm) 32 of the cylindrical shape which both ends opened. If the quality of the material of a dielectric is not limited to this and has insulation, it is good anything. Moreover, there is no limitation also in a configuration. Although the electrostatic capacity of a dielectric becomes large and it becomes easy to generate ion so that thickness is so thin that an outer diameter is large when a dielectric is made into the shape of a cylindrical shape like this operation gestalt, from the place which generating of ozone also increases to coincidence, the balance of ion and ozone must be considered and a dimension must be determined. From an experimental result, the numeric value which called the outer diameter of a glass tube 32 20mm or less, and called thickness 1.6mm or less is recommended.

[0032] Within and without a glass tube 32, the formal inner electrode 33 and the formal foreign news pole 34 which all rounded off the stainless plain-weave wire gauze to the cylindrical shape are arranged. In a high voltage electrode and the foreign news pole 34, the inner electrode 33 functions as an earth electrode. What carried out roll forming of the wire gauze of 40 meshes which carried out the plain weave of the stainless steel line of SUS316 or SUS304 to the shape of a cylinder is used for the inner electrode 33. What carried out roll forming of the wire gauze of 16 meshes which similarly carried out the plain weave of the stainless steel line of SUS316 or SUS304 to the shape of a cylinder is used for the foreign news pole 34. In addition, a "mesh" means the number of divisions per inch. Therefore, the thing which has the large number of mesh will be said that a mesh is fine. In order that the inner electrode 33 and the foreign news pole 34 may enlarge electrostatic capacity of an apparatus for generating ion 18 and may gather ion generating effectiveness, they are stuck to the glass tube 32.

[0033] The both ends of a glass tube 32 are shut by the plug part material 35 and 36 of an insulator. The plug part material 35 and 36 is fabricated by the outline cylindrical shape with a spring material like rubber, and, it has the circumferential height 40 on a side face, and the edge of a glass tube 32 is inserted in the

circumferential groove 41 made by this circumferential height 40. [while] The periphery slot 42 is made by the peripheral face of the plug part material 35 and 36. The periphery slot 42 uses for fixing an apparatus for generating ion 18 to ventilation compartment 10c.

[0034] A hole 37 is formed in the core of the plug part material 35 and 36. The hole 37 is closed by the thin film at the time of manufacture of the plug part material 35 and 26. Processing which is lost easily is performed to this thin film, when required, this thin film is broken through and an object can be inserted. With this operation gestalt, the hole 37 of the plug part material 36 lets lead wire 38 pass, and lead wire 38 is connected to the inner electrode 33 inside a glass tube 32. Lead wire 39 is connected also to the foreign news pole 34.

[0035] Assembly of an apparatus for generating ion 18 is performed as follows. First, the inner electrode 33 which welded lead wire 38 beforehand is inserted into a glass tube 32. And after breaking through the thin film of the hole 37 of the plug part material 36 by the tool by which the point sharpened and letting lead wire 38 pass to this hole 37, the plug part material 36 is attached in a glass tube 32. Subsequently, the outside of a glass tube 32 is made to carry out fitting of the foreign news pole 34 which welded lead wire 39 beforehand, and the plug part material 35 is attached in the other end of a glass tube 32 on it.

[0036] If alternating voltage is impressed between the electrode 33 which counters on both sides of a glass tube 32, and 34, ionization phenomena, such as discharge, will happen in atmospheric air, and plus ion and an anion will carry out abbreviation equivalent generating. Here, alternating voltage to impress is set to 1.1kV – 2.0kV.

[0037] At this time, as plus ion, optimum dose stability of the $O_2-(H_2O)$ m can be carried out as $H^+(H_2O)$ n and an anion, and it can generate. If these plus ion and an anion are independent, there is no exceptional sterilization effectiveness to the suspension bacteria in air. However, if these ion is made to exist in coincidence in air, plus ion and an anion will adhere to suspension bacteria, and when both react chemically, hydrogen-peroxide H_2O_2 or the hydroxylation radical ($-OH$) which is active species will generate them. Since this H_2O_2 or ($-OH$) very powerful activity is shown, suspension bacteria can be disinfected and sterilized. Disinfection and sterilization of the water retention means 14 are faced using this, and the purpose can be attained by making each ion concentration of the location distant from the generating point of plus ion and an anion 10cm or more [10,000 //cm] into three.

[0038] Drawing 11 is drawing having shown the survival rate of the suspension bacteria in the air over the concentration of the ion emitted from an apparatus for

generating ion. An axis of ordinate shows the survival rate (unit: %) of suspension bacteria, and the axis of abscissa shows ion concentration unit: piece/cm³. In Length 2.0m and 2.5m and an object area with a height of 2.7m (volume 13.5m³), ion was sent out all over space using the apparatus for generating ion 18 in the ambient atmosphere of the temperature of 25 degrees C, and 42% of relative humidity, it ventilated by airflow of 4m³/min, and indoor air was stirred.

[0039] Ion concentration shows measured value with a location of 10cm from the peripheral surface of the glass tube 32 of an apparatus for generating ion 18. The survival rate of suspension bacteria sprinkled *Escherichia coli* about [500–1500 //m] 3 concentration in the shape of *Myst*, and when ion was sent out for 1 hour, it detected it with the number of *Escherichia coli* which remains in air. The number of *Escherichia coli* was extracted for 4 minutes by the flow rate of 40 L/min by air sampler, and is measured.

[0040] According to this drawing, ion is sent out and twisted and the survival rate of the suspension bacteria according to the natural damping after 1-hour progress to a case (ion concentration is 3 about 300 pieces/cm) is 63.5% (36.5% of percentage reduction). There is about 10% of measurement error in the initial concentration (for example, referred to as 500–1500 pieces/m³) of *Escherichia coli*. Therefore, when the survival rate of suspension bacteria is below 53.5% (46.5% of percentage reduction), you may think that there is a bactericidal effect.

[0041] Moreover, when an experimental precision is taken into consideration, the survival rate of the *Escherichia coli* after 1-hour progress sends out and twists ion, and is desirable to a case. [of 60% or more of conditions] When the measurement result of drawing 11 is seen based on this, and about 10,000 ion concentration /is [cm] 3, and a bactericidal effect appears and it becomes more than it, it turns out that a survival rate falls quickly. Therefore, a bactericidal effect can be acquired by making ion concentration or more [10,000 //cm] into three.

[0042] The control circuit of humidification equipment 1 is constituted like drawing 6. The control panel with which 50 is prepared in the front face of housing 10, and 55 show the control board prepared in the interior of housing 10. A driving switch 51, the humidification switch 52, the ion driving switch 53, and the humidity configuration switch 54 are arranged at a control panel 50. A control board 55 is equipped with the switch input circuit 56 which receives the signal from the above-mentioned switch group, and the control section 57 which receives input data from the switch input circuit 56. A control section 57 is a part used as the important point of control, and is equipped with an element required to constitute the

so-called microcomputers, such as CPU and memory.

[0043] A control section 57 controls the apparatus-for-generating-ion drive circuit 58, the ventilation means drive circuit 59, the water supply means drive circuit 60, the heating means drive circuit 61, and the damper drive circuit 62. A signal is told to a control section 57 also from a humidity sensor 63. A humidity sensor 63 is arranged in the part where indoor air circulates by the outside or the inside of housing 10.

[0044] A driving switch 51 turns into a main switch of the humidification equipment 1 whole, and is changed to two conditions of "close" and "OFF." The humidification switch 52 chooses the operation mode of humidification operation, and whenever it pushes, it changes in order of -> "weak" "in" "automatic" -> "a little more than" -> ->"OFF" -> "automatic."

[0045] Although the ion driving switch 53 added the ventilation means 19 and the heating means 20 to an apparatus for generating ion 18 and this, whenever it chooses operation mode and pushes it, it changes in order of "cluster" -> "cleaning 1" -> "cleaning 2" ->"OFF" -> "a cluster."

[0046] The humidity configuration switch 54 chooses one piece from two or more humidity which sets up the humidity of indoor air and was set up at intervals of the predetermined numeric value.

[0047] Next, actuation of humidification equipment 1 is explained. The driving switch 51 is first made into "OFF", a water tank 12 is taken out, water is put into a water tank 12, and it sets on the water receptacle pan 13 again. And a driving switch 51 is made "close." The humidification switch 52 and the ion driving switch 53 serve as automatic ["automatic"] and a "cluster" in the initial state, and if a driving switch 51 is made "close", automatic humidification operation accompanied by ion generating will be started. In addition, a "cluster" means that the ion cluster which is the ensemble of plus ion and an anion is generated with an apparatus for generating ion 18.

[0048] In automatic humidification operation, the predetermined time drive of the heating means 20 and the ventilation means 19 is carried out, stopping the water supply means 45 at the beginning, as shown in drawing 7 . Thereby, air is sprayed on the water retention means 14. The air in contact with the water retention means 14 takes moisture from the water retention means 14, and dries the water retention means 14.

[0049] The air in contact with the water retention means 14 is heated by the heating means 20, and serves as about 60-70-degree C warm air, and desiccation is

promoted. A bactericidal effect also increases. Thus, when the water retention means 14 dries, the bacteria, the mold, algae, etc. adhering to the water retention means 14 weaken activity. Moreover, stinking thing generating is also prevented.

[0050] The energization to the heating means 20 is severed after predetermined time progress, and heating of air stops. The water supply means 45 starts operation to substitution, and the water retention means 14 is filled with water. The water retention means 14 will be in a damp or wet condition, moisture transfers to the air passing through the inside of it, and the humidity of air rises. The air which raised humidity blows off from an outlet 24, and raises indoor humidity.

[0051] A big aperture is between the humidity set up by the humidity configuration switch 54, and the actual humidity measured with the humidity sensor 63, when it is required to supply a lot of moisture to indoor air quickly, the energization to the heating means 20 is continued and after the start up of the water supply means 45 makes warm air in contact with the water retention means 14. Since the evaporation of water rises by this, many moisture can be included by the inside of air. The warm air temperature at this time is a little lower than the temperature when drying the water retention means 14, and is made into about 40–50 degrees C. If measurement humidity approaches setting humidity, the energization to the heating means 20 will be stopped.

[0052] An apparatus for generating ion 18 also starts operation with the water supply means 45. At this time, the damper drive circuit 62 has changed the damper 23 to the direction of the ion outlet 22, and an ion cluster is indoors sent out from the ion outlet 22. And the bacteria which float during indoor air are surrounded, and the plus ion which carried out abbreviation equivalent generating, and an anion react chemically, produce hydrogen-peroxide H_2O_2 or the hydroxylation radical ($-OH$) which is active species, and disinfect and sterilize.

[0053] Thus, if an apparatus for generating ion 18 is used together, carrying out humidification operation, since the rate of habitation of an influenza virus will fall by the humidity rise in air and suspension bacteria other than an influenza virus will also be made by the ion cluster, comfortable air is acquired.

[0054] In addition, if the ratio of the plus ion which an apparatus for generating ion 18 generates, and an anion is changed and the ratio of an anion is made [many], the relaxation effectiveness arises to indoor people and indoor environment can be made more comfortable.

[0055] In automatic humidification operation, while the amount of humidification is automatically adjusted so that the set-up humidity may be maintained, water

retention means desiccation operation is performed on the way. That is, if the humidity which a humidity sensor 63 detects reaches setting humidity as shown in drawing 8, the water supply means 45 and an apparatus for generating ion 18 will suspend operation, and only the heating means 20 and the ventilation means 19 will be operated. Like water retention means desiccation operation immediately after the start up of humidification equipment 1, since the heating means 20 heats air at about 60–70 degrees C, the water retention means 14 is dried quickly and the bacteria, the mold, algae, etc. which are breeding with the water retention means 14 weaken activity. Stinking thing generating is also prevented.

[0056] If the humidity which a humidity sensor 63 detects falls to a predetermined value, water retention means desiccation operation will be ended, and humidification operation is resumed. Thus, humidification operation and water retention means desiccation operation are repeated by turns.

[0057] If a driving switch 51 is made into "OFF" in the middle of automatic humidification operation, an operation post process will be performed like drawing 9. That is, operation of the water supply means 45 and an apparatus for generating ion 18 stops, and the energization to the heating means 20 is started. After performing predetermined time water retention means desiccation operation by about 60–70-degree C warm air, the energization to the heating means 20 is severed. Since the ventilation means 19 continues operation, desiccation of the water retention means 14 is continued cooling the heating means 20 with remaining heat.

[0058] Thus, after going into the remaining-heat cooling phase of the heating means 20, an apparatus for generating ion 18 starts operation. At this time, the damper drive circuit 62 changes a damper 23 to the water retention means 14 side. Thereby, the ion cluster which the apparatus for generating ion 18 generated is sprayed on the water retention means 14, spreads round the whole water retention means 14, and disinfects and sterilizes the bacteria adhering to the water retention means 14. After predetermined time progress, the ventilation means 19 and an apparatus for generating ion 18 suspend operation, and humidification equipment 1 will be in a drop dead halt condition.

[0059] As mentioned above, in automatic humidification operation, if the humidity which a humidity sensor 63 detects reaches setting humidity, it will shift to water retention means desiccation operation. Operation in which the humidification switch 52 will be concerned with setting humidity, and will evaporate the moisture of the specified quantity that there is nothing if it doubles with "a little more than", "inside" or, and "weakness" is performed.

[0060] For example, in "a little more than", the blast weight of the ventilation means 19 and the amount of heating of the heating means 20 are adjusted so that water may evaporate in about 250ml /"in" about 400ml /and may evaporate at a rate of about 100ml/hour "weakly" an hour in an hour.

[0061] In operation of these "a little more than", "inside", and "weakness", it is that water retention means desiccation operation is performed only at the start-up and shutdown time, and water retention means desiccation operation is not performed in the middle of humidification operation.

[0062] In addition, when the ion driving switch 53 is doubled with "OFF", also in any of a little more than ["automatic", / "a little more than"], "inside", and "weakness", humidification operation and water retention means desiccation operation without ion generation are performed.

[0063] When the another side humidification switch 52 is set by "OFF", only ion sending out can be performed without humidification. That is, if the ion driving switch 53 is made into the "cluster", an apparatus for generating ion 18 starts ion generation at the same time it makes a driving switch 51 "close", the ventilation means 19 will also start ventilation and an ion cluster will be sent out from the ion outlet 22.

[0064] If the ion driving switch 53 is made "cleaning 1", a damper 23 will change to the water retention means 14 side, an ion cluster is sprayed on the water retention means 14, and disinfection and sterilization are performed.

[0065] If the ion driving switch 53 is made "cleaning 2", the heating means 20 will energize, the warm air and the ion cluster which are about 60-70 degrees C are sprayed on the water retention means 14 by coincidence, and disinfection and sterilization carry out synchronization to warm air desiccation.

[0066] As mentioned above, since warm air generating and ion generation for water retention means desiccation may be compatible, even if they drive an apparatus for generating ion 18 during a water retention means drying period, they do not interfere in drawing 7 , and 8 and 9.

[0067] Moreover, if the humidification switch 52 is made into "a little more than", "inside" or, and "weakness" and the ion driving switch 53 is made into a "cluster", "cleaning 1" or, and "cleaning 2", disinfection and sterilization of the water retention means 14 can be performed, sending out an ion cluster indoors or humidifying humidifying.

[0068] As mentioned above, although this invention was explained per [which was applied to stand-alone humidification equipment] operation gestalt, this invention

can be carried out also when adding a humidification function to various air-conditioning equipment, such as an air conditioner and an air cleaner. Moreover, it is also possible to perform the following corrections in operation.

[0069] For example, it is a water retention means. What was illustrated to drawing 4 can also be made into honeycomb structure as shows this to drawing 10 although each mass serves as a grid configuration of a quadrilateral. Furthermore, if the ingredient of a water retention means is not necessarily restricted to a nonwoven fabric and a damp or wet condition can be maintained according to capillarity, it is good anything.

[0070] It is not necessarily limited to the method which trickles water from the upper part also about a water service system. It may apply rather than a side face, or water may be supplied according to spraying. In short, supply of water is severed by halt of a water supply means, and it has only to become possible to dry a water retention means.

[0071] Moreover, although the whole quantity of an ion cluster is indoors sent out at the time of automatic humidification operation, it is good also as spraying the part thru/or whole quantity on a water retention means.

[0072] Moreover, ventilation means are also fans other than a propeller fan, for example, a sirocco fan, or it can constitute with a cross-flow fan. Not a nichrome wire heater but a positive thermistor may constitute a heating means.

[0073] In addition, various modification can be added and carried out in the range which does not deviate from the main point of invention.

[0074]

[Effect of the Invention] In the humidification equipment equipped with the water retention means, a water supply means to put this water retention means on a damp or wet condition, and a ventilation means to contact air for the water retention means of a damp or wet condition, to transfer moisture to air, and to send out this air indoors, in this invention By stopping a water supply means, driving only a ventilation means, and drying a water retention means, since humidification operation which drives a water supply means and a ventilation means to coincidence, and water retention means desiccation operation which stops a water supply means and drives only a ventilation means were enabled Bacteria, mold, algae, etc. breed in a water retention means, and it can control generating an offensive odor or becoming the cause of an infectious disease. And drugs are not needed for this.

[0075] Moreover, water retention means desiccation operation of predetermined time is performed at first at the time of the start up of humidification equipment, and

since it shifted to humidification operation after that, though bacteria, mold, algae, etc. were breeding during the shutdown period, where the activity is weakened, it can humidify. Stinking thing generating in early stages of operation is also prevented.

[0076] Moreover, at the time of operation termination of humidification equipment since water retention means desiccation operation of predetermined time is performed and the drop dead halt of the humidification equipment is carried out after that, it can prevent bacteria, mold, algae, etc. breeding during a shutdown period.

[0077] Moreover, since it enabled it to heat the air in contact with a water retention means with a heating means at the time of humidification operation, more moisture is evaporated and humidification can be sped up.

[0078] Moreover, since it enabled it to heat the air in contact with a water retention means with a heating means at the time of water retention means desiccation operation, more moisture is evaporated and desiccation of a water retention means can be promoted.

[0079] Moreover, at the time of operation termination of humidification equipment, predetermined time uses a ventilation means and a heating means together, water retention means desiccation operation is performed, and after that, since the heating means was stopped, and it was made to stop after carrying out water retention means desiccation operation only with the ventilation means, predetermined time can carry out the drop dead halt of the humidification equipment, after fully cooling a heating means, and can raise safety.

[0080] Moreover, since air was heated by the elevated temperature rather than the time of humidification operation at the time of water retention means desiccation operation while enabling it to heat the air in contact with a water retention means with a heating means at the time of humidification operation or water retention means desiccation operation, a water retention means can fully be dried and sterilization also progresses.

[0081] Moreover, since the apparatus for generating ion which sends out ion during indoor air was put side by side to humidification equipment, disinfection and the bactericidal effect of the bacteria which increase the amount of ion in air and float in the relaxation effectiveness or air can be acquired.

[0082] Moreover, since the ion which the apparatus for generating ion generated is sprayed on a water retention means at the time of humidification operation or water retention means desiccation operation, a water retention means can be disinfected and sterilized with ion.

[0083] Moreover, since a part of airstream generated by the ventilation means is sent into an apparatus for generating ion, it is not necessary to prepare the fan only for apparatus for generating ion.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The outline vertical cross section showing 1 operation gestalt of this invention humidification equipment

[Drawing 2] The vertical cross section of the cap combined with a water tank

[Drawing 3] The partial horizontal sectional view of a cap

[Drawing 4] The perspective view of a water retention means and a water supply means

[Drawing 5] The sectional view of an apparatus for generating ion

[Drawing 6] The circuit block diagram of humidification equipment

[Drawing 7] The sequence diagram at the time of an automatic humidification start up

[Drawing 8] The sequence diagram in the middle of automatic humidification operation

[Drawing 9] The sequence diagram at the time of automatic humidification operation termination

[Drawing 10] What makes it the same perspective view as drawing 4 , and shows the modification of a water retention means

[Drawing 11] Drawing showing the relation between the concentration of the ion generated from an apparatus for generating ion, and the survival rate of suspension bacteria

[Description of Notations]

1 Humidification Equipment

10 Housing

10a Septum

10b Water tank compartment

10c Ventilation compartment

11 Lid

12 Water Tank

12a Filling port

13 Water Receptacle Pan

13a Valve disconnection pin
13b Wood deck
13c, 13d Opening
14 Water Retention Means
15 Water Supply Pipe
16 Conveying Pump
17 Water Spray Pipe
18 Apparatus for Generating Ion
19 Ventilation Means
20 Heating Means
21 Inlet Port
22 Ion Outlet
23 Damper
24 Outlet
25 At Least Water is Sensor.
26 Dropping Hole
27 Cap
27a Water supply opening member
27b Bearing
27c Spoke
27d Water supply opening
28 Shaft
28a Flange
29 Compression Spring
30 Valve Disk
31 Valve Unit
32 Glass Tube (Dielectric)
33 Inner Electrode
34 Foreign News Pole
35 36 Plug part material
37 Hole
38 39 Lead wire
40 Circumferential Height
41 Circumferential Groove
42 Periphery Slot
43 Clearance

45 Water Supply Means
50 Control Panel
51 Driving Switch
52 Humidification Switch
53 Ion Driving Switch
54 Humidity Configuration Switch
55 Control Board
56 Switch Input Circuit
57 Control Section
58 Apparatus-for-Generating-Ion Drive Circuit
59 Ventilation Means Drive Circuit
60 Water Supply Means Drive Circuit
61 Heating Means Drive Circuit
62 Damper Drive Circuit
63 Humidity Sensor

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